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FEASIBILITY OF UTILIZING MDCS TO SUPPORT POT AND I PROGRAM.(U)

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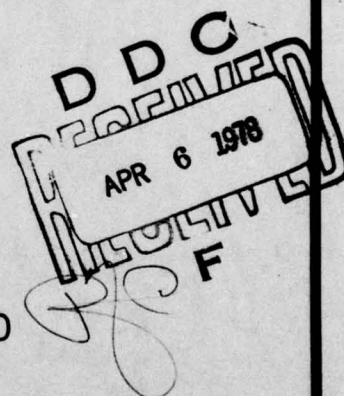
FEASIBILITY OF UTILIZING MDCS  
TO SUPPORT POT&I PROGRAM

March 1976

Prepared for

PERA(CRUDES)  
PHILADELPHIA NAVAL SHIPYARD  
Philadelphia, Pennsylvania

Under Contract N00140-76-D-0813-0003



Publication W76-1803-TN01

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## ABBREVIATIONS

2K	- OPNAV 4790/2K, Ship's Maintenance Action Form
3M	- Maintenance and Material Management
AEL	- Allowance Equipment List
APL	- Approved Parts List
ARL	- Landing Craft Repair Ship
CID	- Component Identification
CSMP	- Current Ship's Maintenance Project
DART	- Detection, Action, Response Technique
DATC	- Development and Training Center
EIC	- Equipment Identification Code
IMA	- Intermediate Maintenance Activity
INSURV	- Board of Inspection and Survey
JSN	- Job Sequence Number
MDCS	- Maintenance Data Collection Subsystem
MIP	- Maintenance Index Page
NA	- Not Applicable
NAVSEC	- Naval Ship Engineering Center
OPNAVINST	- Chief of Naval Operations Instruction
PEB	- Propulsion Examining Board
PERA(CRUDES)	- Planning and Engineering for Repairs and Alterations (Cruisers and Destroyers)
POT&I	- Pre-Overhaul Test and Inspection
RIR	- Repair Inspection Record
ROH	- Regular Overhaul
SFOMS	- Ship's Force Overhaul Management System
SWBS	- Ship's Work Breakdown Structure
SYSCOM	- Systems Command
TSU	- TYCOM Support Unit
UIC	- Unit Identification Code

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# 1

## INTRODUCTION AND SUMMARY

### 1.1 GENERAL

This report presents the results of a study to determine the feasibility of utilizing the Maintenance Data Collection Subsystem (MDCS) of the Maintenance and Material Management (3M) Program to support Pre-Overhaul Test and Inspection (POT&I). The study was conducted for PERA (CRUDES) by ARINC Research Corporation under Contract N00140-76-D-0813, Task Order 0003.

This study was basically concerned with the impact of using the MDCS Ship's Maintenance Action Form (OPNAV 4790/2K, ~~Figure 1~~) to record certain test/inspection/repair information currently recorded on the Repair Inspection Record (RIR, ~~Figure 2~~). Task elements included;

- a. Determination of the effect on the 4790/2K (hereafter referred to as "2K") form if used to record the information and parameters specified in the current POT&I plan,
- b. Determination of corresponding effects on the Current Ship's Maintenance Project (CSMP), the MDCS, and other documentation/procedures, and
- c. Identification of possible solutions and required changes to utilize the MDCS for recording and processing POT&I program information.

### 1.2 APPROACH

For purposes of this study, a promising method of utilizing the MDCS and existing POT&I practices in combination during ROH planning was hypothesized. This method consists of the following approach:

- a. Use blocks 1-15 of the RIR (see Figure 2) to record POT&I planning data.
- b. Upon conduct of POT&Is, record maintenance requirements on the 2K form, (see Figure 1).

In this hypothesized procedure, a single 2K form would be prepared, where appropriate, to cover the maintenance requirements of each RIR. The boundaries established for each RIR would be as defined in the General POT&I Index (Appendix 2, Technical Specification 4730-100).

The effects, advantages and disadvantages of the above hypothetical approach were examined relative to the following specific maintenance management functions:

- a. Screening and authorization of ROH work



OPNAV 4790/2K (Rev. 6-73)		SHIP'S MAINTENANCE ACTION FORM (2-KILO)				CONF <input type="checkbox"/> REFL <input type="checkbox"/>	
<b>SECTION I. IDENTIFICATION</b>		<div style="display: flex; justify-content: space-between;"> <div>1. SHIP'S UIC</div> <div>2. WORK CENTER</div> <div>3. JOB REQ. NO.</div> <div>4. APL/REL</div> </div>					
<div style="display: flex;"> <div style="flex: 1;">5. SHIP'S NAME</div> <div style="flex: 1;">6. EQUIPMENT NAME</div> </div>		<div style="display: flex; justify-content: space-between;"> <div>7. HULL NUMBER</div> <div>8. IDENT. / EQUIPMENT SERIAL NUMBER</div> <div>9. SIC</div> </div>				<div style="display: flex; justify-content: space-between;"> <div>10. LOCATION (Compartment/Deck/Frame/Side)</div> <div>11. WHEN DISCOVERED DATE YR. DAY</div> </div>	
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571. S/F**		572. S/F**		573. S/F**		574. S/F**	
575. S/F**		576. S/F**		577. S/F**		578. S/F**	
579. S/F**		580. S/F**		581. S/F**		582. S/F**	
583. S/F**		584. S/F**		585. S/F**		586. S/F**	
587. S/F**		588. S/F**		589. S/F**		590. S/F**	
591. S/F**		592. S/F**		593. S/F**		594. S/F**	
595. S/F**		596. S/F**		597. S/F**		598. S/F**	
599. S/F**		600. S/F**		601. S/F**		602. S/F**	
603. S/F**		604. S/F**		605. S/F**		606. S/F**	
607. S/F**		608. S/F**		609. S/F**		610. S/F**	
611. S/F**		612. S/F**		613. S/F**		614. S/F**	
615. S/F**		616. S/F**		617. S/F**		618. S/F**	
619. S/F**		620. S/F**		621. S/F**		622. S/F**	
623. S/F**		624. S/F**		625. S/F**		626. S/F**	
627. S/F**		628. S/F**		629. S/F**		630. S/F**	
631. S/F**		632. S/F**		633. S/F**		634. S/F**	
635. S/F**		636. S/F**		637. S/F**		638. S/F**	
639. S/F**		640. S/F**		641. S/F**		642. S/F**	
643. S/F**		644. S/F**		645. S/F**		646. S/F**	
647. S/F**		648. S/F**		649. S/F**		650. S/F**	
651. S/F**		652. S/F**		653. S/F**		654. S/F**	
655. S/F**		656. S/F**		657. S/F**		658. S/F**	
659. S/F**		660. S/F**		661. S/F**		662. S/F**	
663. S/F**		664. S/F**		665. S/F**		666. S/F**	
667. S/F**		668. S/F**		669. S/F**		670. S/F**	
671. S/F**		672. S/F**		673. S/F**		674. S/F**	
675. S/F**							



- b. ROH work planning, including the management and control of shipyard, IMA, and ship's force work
- c. Management and control of INSURV deficiencies
- d. Reliability, maintainability and maintenance history analysis.

### 1.3 SUMMARY OF CONCLUSIONS

The following conclusions were drawn from this study.

#### 1.3.1 Combining MDCS/POT&I Procedures

Accomplishing ROH planning by recording POT&I planning data in blocks 1-15 of the RIR, and recording maintenance requirements using the 2K form, is considered feasible. This practice has the advantage that it would reduce redundancy by eliminating the need to record material condition and maintenance requirements in blocks 16 and 21 of the RIR. Additional advantages of this practice include the following:

- a. Traceability between the POT&I program and the ROH work package would be enhanced, resulting in increased ability to develop POT&I program standards and evaluate POT&I program effectiveness.
- b. It is responsive to the intent of OPNAVINST 4790.4 that maintenance data collection or reporting requirements other than those specified in the 3M manual are not to be levied on the Fleet without CNO approval.

#### 1.3.2 RIR Boundary Definitions

Utilizing current RIR boundary definitions as the basis for preparing 2Ks (i.e., preparing one 2K for each RIR) has both advantages and disadvantages. Advantages are that this practice standardizes the level of 2K reporting, reduces the number of line items that must be controlled during ROH, and enhances traceability between the POT&I program and the ROH work package. The general disadvantage is that some degree of detail is sacrificed with respect to precise identification of accomplishing activity, priority, and equipment (i.e., APL/CID).

The nature of the effects, advantages and disadvantages of utilizing RIR boundary definitions is summarized in Table 1, relative to the specific maintenance management functions previously mentioned. The conclusions summarized in Table 1 are further discussed in Section 3.

#### 1.3.3 EIC/SWBS Interface

The combined utilization of the POT&I program and MDCS in accomplishing ROH will be affected by the extent to which EIC-SWBS interface problems are resolved. Hence, in the long run the best method of tracking between RIRs and 2Ks will depend on the manner in which the single-language concept is eventually implemented within the Navy. There are several feasible interim solutions, including:

- a. Entering the SWBS number in block 14 (EIC), or block 46 (Special Purpose) of the 2K form.

TABLE 1. IMPACT OF USING RIR BOUNDARY DEFINITIONS TO PREPARE 2Ks

MAINTENANCE MANAGEMENT FUNCTION	IMPACT OF UTILIZING RIR BOUNDARY DEFINITIONS		
	EFFECT	ADVANTAGES	DISADVANTAGES
Work definition, including screening and authorization	Work items (i.e., each RIR) often combine maintenance requirements of more than one echelon of maintenance, more than one level of priority and more than one reason for deferral.	Fewer 2Ks to process during screening; work on related equipments and same system is integrated into a single form.	Complicates decision making process when defined work item is "partially approved". Sacrifices visibility and control of parts of the work item relative to priority and accomplishing activity.
Management and control of shipyard ROH work	Based on existing practices sometimes more than one job order would be required to cover a given RIR item; in a few cases, more than one RIR item would be combined into a single job order.	In cases where RIR boundary definitions are compatible with job order boundary criteria, traceability between work requests and job orders is improved.	In cases where RIR boundary definitions differ from job order boundary criteria, traceability becomes more difficult.
Management and control of IMA ROH work	IMA work, in some cases, would be combined with shipyard or ship's force work into a single item.	Eliminates certain source data redundancy when IMMS is used.	None
Management and control of ship's force ROH work	Ship's force work in some cases would be combined with yard or IMA work into a single item; in other cases, the requirements of more than one work center would be combined into a single 2K.	Eliminates certain source data redundancy when SFOMS is used.	Visibility and control at the "accomplishing work center" level is sacrificed when management of ship's force package not supported by SFOMS.
Maintenance history, reliability and maintainability analysis	Instance of combining more than one APL/CID item onto a single 2K is greatly increased. Hence, percentage of maintenance actions classified in machinery history reports as "NO APL" would increase.	None	Visibility provided by maintenance history summaries that are based on APL (e.g., "DART" listings and "Logistics High Failure Report(s)" is decreased. Automatic analysis capability in essence shifts from APL level to EIC level.
Management and control of INSURV deficiencies	Work items (i.e., each RIR) would sometimes combine more than one INSURV deficiency.	None	Visibility and accountability of INSURV deficiencies through CSMP is decreased.



- b. Entering the applicable SWBS and item numbers (as appearing in blocks 4 and 5 of the RIR) into block 35 or 46 of the respective 2K.
- c. Entering the applicable POT&I item key number (from the CRUDES POT&I Index) into block 35 or 46 of the 2K.

#### 1.3.4 Maintenance Planning/Reporting

A review of three recent FF-1052 Class ROH programs shows that relative level of maintenance planning/reporting varies from ship to ship and equipment to equipment. In some cases, one RIR resulted in one work request, which in turn resulted in one shipyard job order. In other instances, one RIR resulted in several work requests, which in turn resulted in one job order. On rare occasions, several RIRs resulted in one work request and one shipyard job order. Appendix A elaborates on this matter on a system-by-system basis.

In certain respects it would be advantageous if there were common rules governing the level of reporting used in all records associated with maintenance management. This would be difficult, if not impossible, to achieve due to the diverse needs of maintenance planning and maintenance analysis. A compromised approach to ROH planning might be warranted, i.e.,

- a. Where appropriate, prepare more than one 2K to cover a given RIR. The basis for preparing more than one 2K would be to limit each 2K to maintenance requirements of a single priority level and a single accomplishing activity.
- b. Provide a means to ensure positive traceability between RIRs and 2Ks.
- c. Relax existing 3M rules to permit utilization of the term "Various" in blocks 4 (APL/AEL), 13 (Ident/Equip. Serial No.) and 16 (Location) of the 2K.

#### 1.3.5 RIR vs. SWBS Level of Detail

In most cases the level of detail defined by current RIRs is at least as great as the degree of detail defined by the three-level SWBS. In fewer cases the RIR level of detail is as great as the four-digit EIC. Table 2 substantiates this conclusion at the major shipboard system level. Appendix B summarizes the comparative levels of RIR/SWBS/EIC detail relative to individual subsystems/equipments. The data contained in Table 2 and Appendix B form the basis for the following conclusions:

- a. Since RIRs are usually written at a lower level than the SWBS third level, the POT&I program would benefit from expansion of SWBS.
- b. If it is desired to create a degree of POT&I visibility and control comparable to the three-level EIC, then certain RIRs should be subdivided. (Appendix B identifies those RIRs that are candidates for subdivision).

#### 1.3.6 Other Alternatives

The main objective of this study was to examine the effects, advantages, and disadvantages associated with the hypothesis described in Section 1.2. Related alternatives or variations may be equally worthy of consideration, as discussed in Section 4.

TABLE 2. COMPARISON OF RIR, SWBS AND EIC REPORTING LEVELS

SWBS NO.	MAJOR SYSTEM	TOTAL NO. OF POT/I (RIR) ITEMS	DEGREE OF DETAIL - POT/I (RIR) ITEMS					
			RELATIVE TO SWBS (3RD LEVEL) (NO. OF POT/I ITEMS WITH:)			RELATIVE TO EIC (3RD LEVEL) (NO. OF POT/I ITEMS WITH:)		
			LESS DETAIL	SAME DETAIL	GREATER DETAIL	LESS DETAIL	SAME DETAIL	GREATER DETAIL
100	HULL STRUCTURE	33	6	17	10	6	19	8
200	PROPULSION PLANT	55	0	7	48	8	19	28
300	ELECTRIC PLANT	22	0	7	15	7	8	7
400	COMMAND & SURVEILLANCE	108	0	18	90	91	15	2
500	AUXILIARY SYSTEMS	108	1	19	88	21	31	56
600	OUTFIT & FURNISHINGS	35	1	23	11	9	12	14
700	ARMAMENT	27	0	5	22	16	3	8
TOTAL		388	8	96	284	158	107	123

## 2 BACKGROUND

### 2.1 POT&I PROGRAM

The current POT&I program for surface ships (less carriers) consists of two steps:

- a. A POT&I plan is prepared to identify all tests and inspections required to develop a complete repair package with a designated inspection activity for each. This plan includes:
  - 1) An index of the ROT&I items planned for the ship
  - 2) A set of RIR forms (see Figure 2) for the items
  - 3) Test procedures and data sheets
- b. The POT&I, as prescribed in the plan, is conducted and results prepared in the form of a POT&I report. The report includes:
  - 1) All completed RIR sheets, with test/inspection results recorded in block 16 and scope of repair recommendations recorded in block 21.
  - 2) Applicable supplementary reports (INSURV, PEB, etc.)
  - 3) Applicable Maintenance Action Forms (4790/2K), filled out for applicable items of deferred maintenance.
  - 4) Completed test procedures used during execution of the POT&I.

The POT&I program is conducted in accordance with PERA(CRUDES) Technical Specification No. 4730-100.

### 2.2 MAINTENANCE DATA COLLECTION SUBSYSTEM

The MDCS is the means by which deferred and completed maintenance actions are recorded, stored, and retrieved for specified categories of equipments. The essence of MDCS is the 2K form. The scope of the program, instructions for completing the 2K form and related criteria and procedures are contained in the Ships 3M Manual, OPNAVINST 4790.4.

### 2.3 SIMILARITIES IN 2K and RIR

Many of the data elements recorded on the 2K and RIR forms are similar. Figure 3 illustrates the common and unique elements of the two forms. The considerable commonality of content suggests the possibility that POT&I program requirements and objectives can be at least partially supported within the current framework of MDCS. The feasibility of such action is discussed in Section 3.

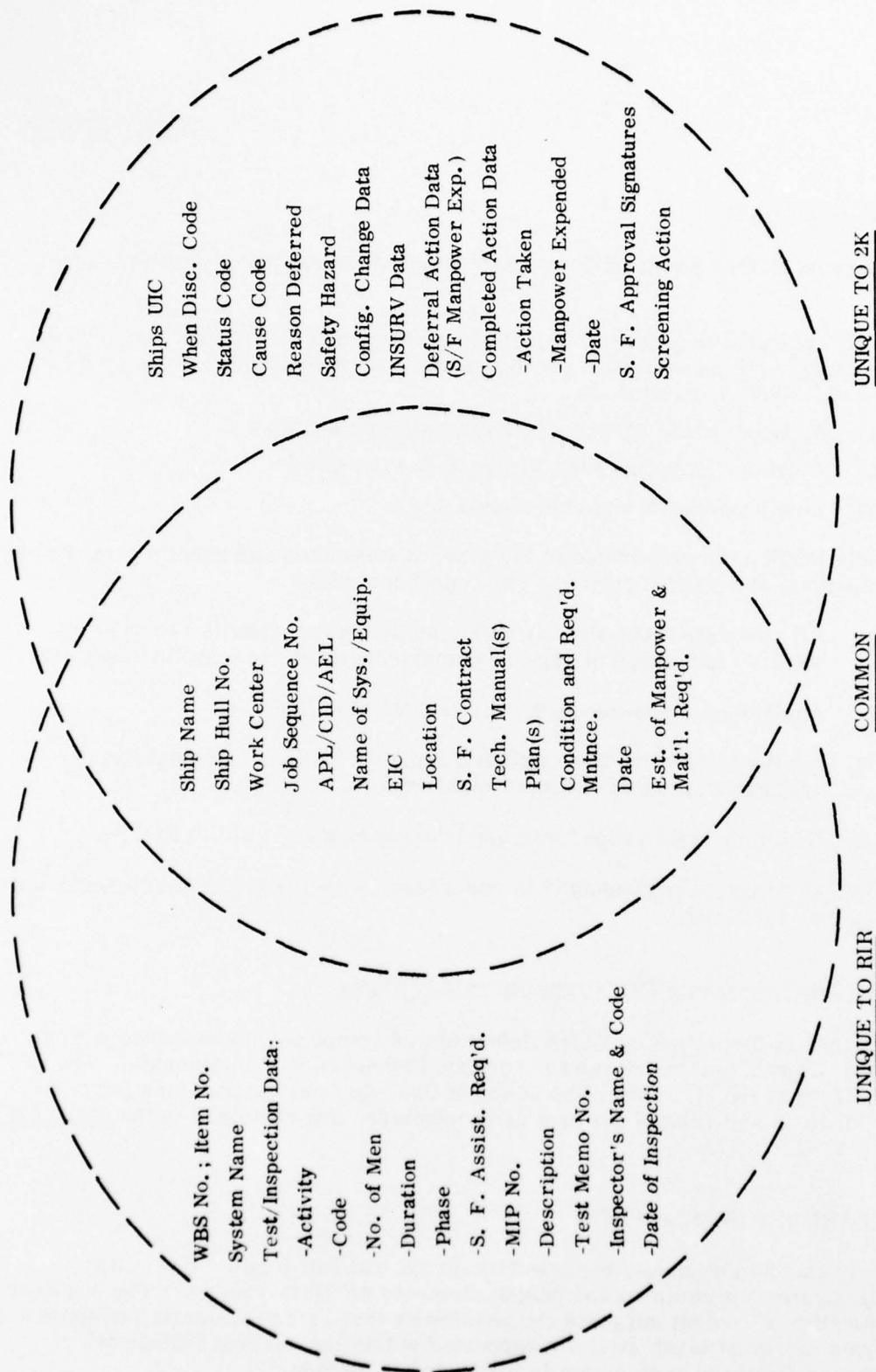


Figure 3. Data Elements on RIR and 2K Forms



## 3 ANALYSIS

This section describes the effects of utilizing the system/equipment boundary definitions established by POT&I Repair Inspection Records as the basis for generation of Maintenance Action Forms during overhaul planning.

### 3.1 BACKGROUND

The shaded areas of Figure 4 identify the specific data fields within the 2K form that together define/describe the level of maintenance being recorded. Utilization of the boundary criteria established by RIRs impacts on each of the shaded blocks. The impact is considered herein relative to the following significant maintenance management functions:

- a. Work definition, including screening and authorization
- b. ROH work planning, including the management and control of shipyard, IMA and ship's force work
- c. Reliability and maintainability analyses
- d. Maintenance history analysis
- e. Management and control of INSURV deficiencies.

### 3.2 DISCUSSION OF AFFECTED DATA ELEMENTS

#### 3.2.1 Work Center

For ships, the work center code is a four-position indicator, based on department, division, and division group. Though some degree of standardization exists in identifying work centers, the precise identifiers vary from ship to ship. It is inferred from OPNAVINST 4790.4 that the work center code entered in block 2 of the 2K form is to be the lead work center for the recorded maintenance action. Likewise, it is inferred from OPNAVINST 4790.4 that a given 2K may define the actions of more than one work center. Repair Inspection Records usually, though not always, define an area of maintenance that is the responsibility of a single work center. Hence, if during ROH planning a single 2K is prepared for each RIR, most 2Ks would involve a single work center. Examples of exceptions include: propulsion control consoles (POT&I item 252-01), main steam piping system (POT&I item 253-01), ventilation system (POT&I item 512-01), painting (POT&I item 631-01), and deck covering (POT&I item 634-01).

The practice of combining the work of more than one work center into a single 2K form limits the utility of the CSMP relative to ship's force work, since it would

OPNAV 4790/2K (Rev. 6-73)		SHIP'S MAINTENANCE ACTION FORM (2-KILO)				COMP		DEF	
SECTION I. IDENTIFICATION									
1. SHIP'S UIC		2. WORK CENTER		3. JOB NO. NO.		4. ORG/AGL			
5. SHIP'S NAME		6. EQUIPMENT NAME				7. EQUIPMENT SERIAL NO.			
8. HULL NUMBER		9. IDENT / EQUIPMENT SERIAL NUMBER				10. EIC			
11. SAFETY HAZARD		12. LOCATION (Room/Deck/Room/Room/Room/Room)				13. WHEN DISCHARGED DATE			
14. ALTERATIONS (SPLINT, ORGALT, Fld Lg, etc.)		15. FOR INSURANCE USE				16. SUPPLY NUMBER			
SECTION II. DEFERRAL ACTION									
17. S/P HOURS, EXP.		18. DEFER DATE		19. S/P HOURS, REM.		20. DEADLINE DATE			
SECTION III. COMPLETED ACTION									
21. ACT. TUN.		22. S/P HOURS		23. COMPLETION DATE		24. ACT. MAINT. TIME			
SECTION IV. REMARKS/DESCRIPTION									
25. REMARKS/DESCRIPTION									
26. COMP. SUMMARY									
27. FIRST CONTACT/MAINT. MAN (Print)		28. RATE		29. SECOND CONTACT/SUPERVISOR (Print)		30. INTEGRATED PRIORITY		31. SCHED. START DATE	
32. DIV. UNIT.		33. DEPT. UNIT.		34. COMMANDING OFFICER'S SIGNATURE		35. TYCON AUTHORIZATION		36. SCHED. COMP. DATE	
37. SPECIAL PURPOSE		38. RATE		39. SECOND CONTACT/SUPERVISOR (Print)		40. INTEGRATED PRIORITY		41. SCHED. COMP. DATE	
SECTION V. SUPPLEMENTARY INFORMATION									
42. BLUEPRINTS, TECH. MANUALS, PLANS, ETC.		43. AVAILABLE ON BOARD		44. PREARRIVAL/ARRIVAL CONFERENCE ACTION/REMARKS		45. SCHED. COMP. DATE			
SECTION VI. REPAIR ACTIVITY PLANNING/ACTION									
46. REPAIR W/C		47. EST. HOURS		48. ASST. REPAIR W/C		49. ASST. EST. HOURS		50. SCHED. START DATE	
51. REPAIR ACTIVITY UIC		52. WORK REQ. ROUTINE		53. EST. HOURS		54. EST. HOURS		55. SCHED. COMP. DATE	
56. EST. TOTAL COST \$		57. JOB ORDER NUMBER		58. LEAD PRE CODE		59. DATE OF EST.		60. SCHED. COMP. DATE	
61. FINAL ACT		62. HOURS EXPENDED		63. DATE COMPLETED		64. COMPLETED BY (Signature - Rate)		65. ACCEPTED BY (Signature - Rate/Rate)	

Figure 4. OPNAV Form 4790/2K, Showing Data Fields That Establish Level of Maintenance

provide listings that are based on lead rather than accomplishing work centers. Hence, summaries of estimated manpower requirements as provided in CSMP reports would become less meaningful at the work center level. It should be noted that the Ship's Force Overhaul Management System (SFOMS), if used, could compensate for any loss of detail within the CSMP.

### 3.2.2 APL/CID/AEL

As prescribed in OPNAVINST 4790.4, the APL/CID/AEL of the equipment being reported is to be entered in block 4 of the 2K. It is further stipulated that "Not Listed" or "Not Applicable" be entered, as appropriate. The 3M manual does not specify reporting level, implying that a single 2K can cover any appropriate level of maintenance from "boiler" to "safety valve". It is inferred from the 3M manual, however, that grouping more than one APL/CID/AEL within a single 2K form is not intended.

In most cases, RIRs are written at a level that embraces more than one APL/CID/AEL. (The data presented in Appendix C identify the ship systems/equipments that normally include more than a single APL/CID/AEL.) Consequently, implementation of the practice of preparing one 2K for one RIR would require refinement of 3M criteria to permit multiple APL/CID/AEL coverage on a given 2K. This would require that, where appropriate, "Various" be entered in block 4. Such a procedure would not detract from the utility of the CSMP, since APL/CID/AEL is not a basis for control in CSMP summary reports. It would, however, limit the utility of the 2K as an ROH planning document since the 2K is now sometimes used as a reference source in identifying APL/CID/AEL. It is noted that other sources (e.g., the COSAL "E" deck, and planned/actual shipyard MIS data banks) could also provide this reference.

The most significant effect of multiple APL/CID/AEL reporting is in the summary and analysis of completed maintenance actions. It is intended that the MDCS be capable of producing maintenance history information and supporting reliability/maintainability analysis at the lowest possible level of APL/CID/AEL identification. Several existing programs (e.g., the Navy Detection, Action, Response Technique Program) depend on APL/CID/AEL level information. Table 3 provides a sample listing of the specific MDCS report products that are based on or list the APL/CID/AEL.

Implementation of the "one 2K for one RIR" concept would in general decrease the percentage of MDCS data relatable to individual APL/CID/AEL items. The significance of this effect varies from item to item, depending on whether that item contains "many" or "few" different APL/CID/AELs. Appendix C provides data illustrating, on a case-by-case basis, the degree to which each ship system equipment would be affected by multiple APL/CID/AEL reporting in the MDCS.

### 3.2.3 Equipment Noun Name

As specified in the 3M manual, the noun name of the equipment/system covered by a given 2K is entered in block 5. The noun name is limited to 16 positions. The 3M manual also specifies that, where applicable, the AN designation for electronic equipments will be used instead of noun name.

In completing 2Ks from boundaries defined by the RIRs, administrative rules regarding use of abbreviations and use of RIR nomenclature are warranted in order

TABLE 3. MDCS DATA PRODUCTS BASED ON APL/AEL (SAMPLE)

MSO Control Number	Report Title	Description	Use		
			Management Information	Analysis	R&M
4790.S2704.D-10	Report of Completed Repair/ Alteration Actions (Condensed)	History of all maintenance, repair, and alterations in sequence by work center, EIC, ID serial number and job sequence number; APL/AEL listed; narrative also listed.		X	
4790.S2704.F-06	Material History (Detailed Record)	History of all actions, displayed in sequence accomplished. Lists APL/ AEL; includes narrative and failed- parts data.		X	
4790.S3300	APL Merit Listing	Listing of APLs in rank order, based on man-hours expended, parts cost, and number of deferrals for parts or assistance.	X		
4790.S3321-01	Organizational Summary Report (by APL)	Listing of total parts cost, man- hours expended and number of actions by APL for a given ship and period.	X		X
4790.S2711-01	Logistics High Failure Equipment Report	Rank-order listing of EIC items showing distribution of actions by APL/AEL. Rank based on weighted consideration of eight factors.	X (DART)	X	X
4790.S3015	DART Tracking Report	Listing of eight factors for each hull within each (or selected) EIC/APL (DART).	X (DART)		
4790.S2739	APL Data Listing	Listing of various data for each reported action, organized by APL/AEL.	X	X	
4790.S2946	Reported Code Summary - by APL	Summary of all maintenance actions for given APL item by type of action taken.		X	



to enhance traceability between the POT&I program and the work package. However, the recording of noun name does not significantly affect any of the ROH planning or maintenance management functions being considered in this report.

#### 3.2.4 Status

In documenting deferred maintenance actions, block 7 of the 2K is used to record the code that most accurately describes the operational performance capability of the item. Codes applicable to this block are:

- 1 = Operational
- 2 = Non-operational
- 3 = Reduced capability
- 0 = Not applicable

The entry in block 7 would normally be affected by the system/equipment level being recorded. For example, if a 2K were prepared for a single forced draft blower, the block 7 entry might be "Non-operational". Conceivably, under the same circumstances, if the 2K were prepared at the combustion air system level, the entry in block 7 might appropriately be "Reduced Capability". Status information, as appearing in block 7, is not included within CSMP reports and its use in conduct of ROH planning functions is not apparent. However, this information is used in measurement of reliability since it contributes to identification of failures.

#### 3.2.5 Cause

Block 8 of the 2K form is used to record cause of failure, malfunction, or need for maintenance. When more than one reason applies, the primary cause is entered. The following codes are used in recording cause:

- 1 = Abnormal environment
- 2 = Manufacturer/installation defects
- 3 = Lack of knowledge or skill
- 4 = Communication problems
- 5 = Inadequate instruction/procedure
- 6 = Inadequate design
- 7 = Normal wear and tear
- 0 = Not applicable

The information entered in block 8 is affected by the system/equipment level being reported. In general, the higher the reporting level the less meaningful the cause information. The cause code entered in block 8 is not included in CSMP reports and is considered to be of limited value during ROH planning. Cause information is potentially useful in performing reliability and related analysis based on maintenance history, but it is not apparent that this information is being utilized to any great extent.

### 3.2.6 Reason for Deferral

Block 9 is used to enter the code that best describes the reason maintenance cannot be performed at the time of deferral. The following codes apply, for deferral:

- 1 = Ship's force work backlog/operational priority
- 2 = Lack of material
- 3 = No formal training in this equipment
- 4 = Formal training inadequate in this equipment
- 5 = Inadequate school practical training
- 6 = Lack of facilities/capabilities
- 7 = Not authorized for ship's force accomplishment
- 8 = For ship's force overhaul or availability work list
- 9 = Lack of technical documentation
- 0 = Other, or not applicable

As in the case of "status" and "cause" codes, the usefulness of deferral reason, as entered in block 9, decreases as the scope of the maintenance item becomes broader.

CSMP reports contain and, in certain cases, are organized by deferral reason. The data provide visibility that can be useful in performance of screening during ROH planning, and of maintainability and related logistics analysis. The extent to which deferral data are actually used for these purposes is not readily apparent.

### 3.2.7 Identification/Equipment Serial No.

As prescribed in the 3M manual, block 13 of the 2K form is used to record the identification or serial number of the maintenance item being recorded. Where appropriate, the terms "Various" or "NA" can be designated. The recording of maintenance items at a more general level will increase the frequency with which the term "Various" is used. While this would detract from the visibility provided by the 2K and CSMP reports (when used during ROH planning), the degree of detracting does not appear to be significant.

### 3.2.8 Equipment Identification Code (EIC)

The first four of the seven positions in block 14 are used to record applicable EIC, as taken from the EIC Master Index. In the four-character EIC, the first character denotes system (e.g., F000, propulsion system); the second character, subsystem (e.g., F300, main condensate and main feed systems); and the last two, equipment (e.g., F308, main feed booster pump).

The intent of the 3M System is that normally the equipment level of recording will apply, although entry of system (F000) or subsystem (F300) codes can be appropriate. In most cases, RIR items are prepared at the same or lower level than the EIC third indenture level. Notable exceptions to this statement include the main steam piping system, switchboards, refrigeration plant and most electronics. (The specific ship systems/equipments whose RIR level normally differs from EIC

equipment level are identified in Appendix B.) It is concluded that preparation of 2Ks using boundary definitions established by RIRs would not significantly affect the utility of the EIC as used in the CSMP and MDCS (except for the aforementioned systems/equipments).

#### 3.2.9 Location

Block 16 of the 2K form is used to record the compartment/deck/frame/side at which the reported item is located. While it is implied that equipment located in more than one compartment would not be combined into a single 2K, this is often done in practice. Preparation of 2Ks using RIR boundary definitions would in some cases impact on existing practices relative to entering the equipment location on the 2K. For example, in some instances the location identification might be possible to only the compartment rather than to the exact frame and side. In other instances it may be necessary to use the term "Various" in block 16. While some visibility may be sacrificed regarding location, the overall impact of using RIR boundary definitions is not considered significant.

#### 3.2.10 INSURV Number

One of the purposes of the MDCS is to provide for the accounting of INSURV deficiencies. In this regard, the MDCS is used to record deficiencies originally identified by INSURV as well as those identified by ship's force prior to INSURV. This is accomplished by the entry of a deficiency code in block 20.

The use of RIR boundary definitions as the basis for 2K preparation would conflict with prescribed INSURV accounting practices only in the event the POT&I program is conducted immediately subsequent to INSURV, since it is conceivable that an RIR item could involve more than a single INSURV deficiency.

#### 3.2.11 Priority

Block 41 of the 2K is used to record the priority applicable to the maintenance being deferred. The following codes are used (definitions of the priority levels are given in the 3M Manual):

- 1 = Mandatory
- 2 = Essential
- 3 = Highly Desirable
- 4 = Desirable

The primary purpose of the priority code is to assist personnel in the process of work approval or in conducting tradeoffs during availability planning. Other potential uses are in assessing material condition or in performing reliability analyses. Utilization of RIR boundary definitions would increase the occurrence of combining into a single 2K those maintenance requirements having varying priority levels. This would detract from the usefulness of the 2K and the CSMP, particularly with respect to work definition.

### 3.2.12 Accomplishing Activity

Identification of accomplishing activity is noted by the screening action entered in blocks 44 and 45. The following codes apply:

- 1 = Depot (shipyard or ship repair facility) accomplish
- 2 = IMA (tender/repair ship, etc.) accomplish
- 3 = TSU (TYCOM support unit/ARL/floating dry dock/DATC, etc.)  
or other technical assistance
- 4 = Ship's force
- 5 = Ship's force assisted by IMA/depot
- 6 = Ship to shop
- 7 = Accomplish with modification
- 8 = Disapproved
- 9 = Remove from CSMP. Pass to history (to be assigned by  
TYCOM only)

In defining deferred maintenance requirements, it is important that the work to be accomplished by each echelon of maintenance be entered on a separate 2K. This criterion is important from the standpoint of the screening, planning, and analysis functions. In many instances a given RIR item will result in work requirements that involve more than one accomplishing activity. In these instances, preparing a single 2K for a given RIR could detract from the utility of the MDCS.

### 3.3 IMPACT ON CSMP

Section 2 described the impact of integrating POT&I and MDCS practices on certain general maintenance management functions. It is also important to consider this impact specifically in terms of CSMP data products.

#### 3.3.1 CSMP

As described in OPNAVINST 4790.4 the CSMP is the basic tool used by ship's force, TYCOM, SYSCOMs, shipyards, and PERA to manage deferred shipboard maintenance. The essence of the CSMP is a set of summary listings generated periodically as requested and distributed to ship's force and other interested agencies. Three types of reports can be generated:

- a. Report Type 1 - A single line summary of each incompletd maintenance action reported on a 2K by ship's force. This report type can be printed in any one of several different optional formats (e.g., by type of availability, managing work center, INSURV number, only safety items, or EIC). Figure 5 is an example of a Report Type 1.



CURRENT SHIPS MAINTENANCE PROJECT REPORT 1 - OPTION E										PRINTED 23 JAN 74	
SUMMARY BY EIC										PAGE- 9	
USS SPRINGFIELD CLG-7 UIC-03566 IUC-CCDL											
EIC	W/C	JSN	MOON NAME	IDENT	CSMP SUMMARY	DEFR DATE	DEFR REAS	PRI	TYPE		
1494	E891	1190	DECK GRATING	B-1-1	REPLACE ALUMINUM DECK GRATING	22DEC73	6	3	2		
310C	E891	1077	SSTG RED GEAR	1-2	THERMOMETER WELLS NOT SECURED	17NOV73	2	3	4		
F181	E891	1155	SUPERHEATER GAGE	1	DISTANT READ THERMOMETER INOP	8MAY73	4	3	1		
F393	E892	1585	MAIN FEED PUMP	4	PUMP END SHAFT SLEEVE SCORED	9APR73	2	2	4		
F491	E891	1121	FDB INSTRUMENTS	1 TO 6	TACHS AND THERMOMS MISSING	9JAN73	2	3	4		
F597	E891	1157	FOH QUIK CLO VLV	1-2	PROTECTIVE SHIELDS NOT INSTAL	9DEC73	2	1	2		
T896	E891	1187	FIRE/FLUSH PUMP	1	TURBINE CASING FLANGE LEAKS	17APR73	6	2	1		
T098	E814	1036	FUEL OIL PIPING	VARIOUS	7 IN FUEL OIL LINE DETERIORATD	19NOV72	6	3	1		
TH99	EM91	1619	VALVE WHEELS	VARIOUS	VALVE WHEELS AND LABELS MISSING	18FEB73	6	3	4		
TH99	EM91	1621	PIPE HANGERS	VARIOUS	HANGERS UNBOLTED CUT OR MISSING	19FEB73	6	3	4		
TH94	EM91	1690	HP/LP STEAM TRPS	VARIOUS	IMPULSE STEAM TRAPS LAGGED	19JUN73	6	3	4		
TH94	EM91	1725	LO PRESS DRAINS	B-2	INVERTED FUNNELS MISSING	12AUG73	2	2	4		
U698	OE91	1078	ELECTRONICS INSP	NO IDENT	PROVIDE RFI SURVEY	3AUG73	6	3	1		
W344	OE92	1018	CAQ1-6198	700558	REQUIRES REPAIR AND CALIBRATION	26FEB73	2	3	2		
WE9J	OE9J	1019	AN/TRN-3	110	REQUIRES REPAIR AND CALIBRATION	26FEB73	2	3	2		
YC94	WD21	0055	GRAVITY DAVITS	STARBD	DAVITS OUT OF ALIGNMENT	3SEP71	2	3	1		
YC95	WD21	1090	WINCH	PORT 2	DECK RUSTED AND PITTED	17JUL73	2	3	1		

Figure 5. Example of CSMP Report Type 1

- b. Report Type 2 - A detailed record of each submitted deferral, organized by JSN within work center. Figure 6 is an example of this report type.
- c. Report Type 3 - Contains the same information as report type 2 except that it is organized by EIC.

### 3.3.2 Uses of CSMP Reports

CSMP reports can be used for a variety of purposes, including:

- a. Determining material condition of the ship, ship system, equipment (as defined by the EIC), and work center.
- b. Estimating manpower requirements for all echelons of maintenance.
- c. Scheduling work
- d. Providing a baseline from which to develop an ROH work package.
- e. Specifying certain details relating to maintenance requirements.

### 3.3.3 Analysis of Impact

Figure 7 illustrates the specific information fields within the 2K that provide the basis for CSMP reports. It is reasoned that any criterion affecting the information content of the shaded blocks will impact on the CSMP. In general, criteria which dictate the recording of data in its most elementary form contribute to the utility of the CSMP, while criteria which allow grouping of maintenance elements into broader items detract from the utility of the CSMP.

The practice of utilizing RIR boundary definitions in preparing 2Ks specifically impacts on the data blocks shaded in Figure 7. Table 4 describes the nature of the effect, and its impact in terms of the previously mentioned CSMP uses.

CURRENT SHIPS MAINTENANCE PROJECT REPORT 2										PRINTED 23 JAN 74	
DETAIL LISTING BY JCN										PAGE 21	
UIC-03566 IUC-CCOL											
USS SPRINGFIELD CLG-7 UIC-03566											
WORK CENTER EBB1											
JSN	NOUM NAME	EIC	IDENT	DEF DATE	DEF REASON	PRI	TYPE	AVAIL	SCRM	COMMENT	
1077	SSTG RED GEAR	B10C	1-2 THERMOMETER WELLS ARE NOT SECURED WITH WIRE AND LEAD SEALS XXX INSTALL WIRES AND SEALS IAW ALCRUDESLANT 025/72	17 NOV 73	LACK OF MATERIAL	3	UNDETERMINED		4		
1121	FDB INSTRUMENTS	F401	1 TO 6 TACHOMETER GAGES AND THERMOMETERS ARE MISSING OR DAMAGED BEY OND ECONOMICAL REPAIR XXX REPAIR DEFECTIVE UNITS	9 JAN 73	LACK OF MATERIAL	3	SHIPS FORCE		4		
1157	FOH QUIK CLO VLV	F507	1-2 FUEL OIL HEATER QUICK CLOSING VALVE DOES NOT HAVE PROTECTIVE SHIELDING INSTALLED IAW NSSTCM 9480-93 AND 9880-1486 XXX FAB RICATE AND INSTALL	9 DEC 73	LACK OF MATERIAL	1	IMA ACCOMPLISH		2	SAF HAZ	
1187	FIRE/FLUSH PUMP	T896	1 TURBINE CASING LEAKS EXCESSIVELY AT FLANGES BETWEEN HALVES S EVERAL ATTEMPTS BY TENDERS TO CORRECT UNSUCCESSFUL XXX REPAIR CASING LEAKS AND RESTORE OTHER COMPONENTS TO ORIGINAL SPECS FIRST CONTACT JOHNSON BT1	17 APR 73	LACK FACIL/CAPAB	2	DEPOT ACCOMPLISH		1	2GB88MP	
1190	DECK GRATING	1404	B-1-1 REPLACE ALUMINUM DECK PLATING XXX FABRICATE AND INSTALL DECK GRATING ON UPPER LEVEL BETWEEN NR 1 AND 2 BOILERS AND BOLT IN PLACE	22 DEC 73	LACK FACIL/CAPAB	3	TYCOM SUPP UNIT		2	SAF HAZ 2GB27MP	
1191	LADDERS	1401	B-1 BOTH INCLINED LADDERS HAVE EXCESSIVELY WORN BENT AND SLIPPER Y TREADS XXX REPLACE TREADS	22 DEC 73	LACK FACIL/CAPAB	2	IMA ACCOMPLISH		2	SAF HAZ	
1194	SMOKE PIPE	F601	2 SMOKE PIPE BETWEEN ECONOMIZER AND 3 RD DECK DETERIORATED TO THE POINT WHERE EXCESSIVE AMOUNTS OF SOOT AND GASES ARE BLOW ING OUT INTO FIRE ROOM CAUSING A HEALTH PROBLEM ON THE UPPER LEVEL XXX RENEW ALL AFFECTED SECTIONS OF CASING AND REPLACE GASKETS FIRST CONTACT JOHNSON BT1	28 DEC 73	LACK FACIL/CAPAB	2	DEPOT ACCOMPLISH		1	SAF HAZ	

Figure 6. Example of CSMP Report Type 2

OPNAV 4790/2K (Rev. 8-73)										SHIP'S MAINTENANCE ACTION FORM (2-KILO)										COMP		DEFL																																															
SECTION I. IDENTIFICATION										JOB CONTROL NUMBER																																																											
1. SHIP'S UIC					2. WORK CENTER					3. JOB REQ. NO.					4. APL/REL																																																						
A. SHIP'S NAME					5. EQUIPMENT WORK NAME					6. W N D					7. S T A					8. C A S					9. D F R		10. 11. 12.																																										
B. HULL NUMBER					13. UICAT/EQUIPMENT SERIAL NUMBER					14. ETC																																																											
15. SAFETY HAZARD					16. LOCATION (HULL/DECK/SPACE/STRUCTURE)					17. WHEN DISCOVERED DATE																																																											
18. ALTERATIONS (SHIPALT, UICALT, PIA CNG, etc.)										19. CONFIGURATION CHANGE										20. FOR INSURANCE USE																																																	
21. ACT. TXN										22. S/F HOURS										23. DEFER DATE										24. DEADLINE DATE																																							
SECTION II. DEFERRAL ACTION										25. S/F HOURS EXP.										26. DEFER DATE										27. S/F HOURS REM.										28. DEADLINE DATE																													
SECTION III. COMPLETED ACTION										29. ACT. TXN										30. S/F HOURS										31. COMPLETION DATE										32. ACT. MAINT. TIME										33. 34. METER READING																			
SECTION IV. REMARKS/DESCRIPTION										35. REMARKS/DESCRIPTION																																																											
37. COMP. SUMMARY										38. FIRST CONTACT/MAINT. NBR (PRINT)										39. RATE										40. SECOND CONTACT/SUPERVISOR (PRINT)										41. 42. 43. INTEGRATED PRIORITY																													
C. DIV. INIT.										D. DEPT. INIT.										E. COMMANDING OFFICER'S SIGNATURE										F. TYCON AUTHORIZATION										SCREENING																													
44. SPECIAL PURPOSE										45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.																																																											
SECTION V. SUPPLEMENTARY INFORMATION										47. BLUEPRINTS, TECH. MANUALS, PLANS, ETC.										48. PREARRIVAL/ARRIVAL CONFERENCE ACTION/REMARKS																																																	
SECTION VI. REPAIR ACTIVITY PLANNING/ACTION										49. REPAIR W/C										50. EST. HOURS										51. ASST. REPAIR W/C										52. ASST. EST. HOURS										53. SCHED. START DATE										54. SCHED. COMP. DATE									
55. REPAIR ACTIVITY UIC										56. WORK REQ. ROUTINE										57. EST. HOURS										58. EST. HOURS										59. EST. MATERIAL COSTS										60. EST. MATERIAL COSTS																			
61. EST. TOTAL COST										62. JOB ORDER NUMBER										63. LEAD P&E CODE										64. DATE OF EST.										65. DATE OF EST.																													
66. FINAL ACT										67. HOURS EXPENDED										68. DATE COMPLETED										69. COMPLETED BY (Signature - Print)										70. ACCEPTED BY (Signature - Print/Name)																													

Figure 7. OPNAV 4790/2K, Showing Data Fields Used in CSMP



TABLE 4. IMPACT OF RIR BOUNDARY DEFINITION ON CSMP

2K DATA ITEMS IN CSMP			CSMP USES					
2K BLOCK	TITLE	EFFECT OF RIR BOUNDARY DEFINITION	Determining Material Condition	Estimating Manpower Requirements	Scheduling Work	Establishing Work Package	Specifying Maintenance Requirement Details	INSURV Deficiency Accounting
A	Ship's Name	None	X					
B	Hull Number	None	X					
1	UIC	None	X					
2	Work Center	In some cases the work of more than one work center would be combined into a single item; work center identified would sometimes represent "lead" center	X	X	X			X
3	Job Sequence No.	None			X	X		X
5	Noun Name	None				X		X
9	Reason for Deferral	In some cases, the work defined by a single 2K would represent multiple reasons for deferral.				X		X
13	Identification/ Equipment Serial Number	Would increase usage of the term "VARIOUS"	X			X		X
14	EIC	Would, in many cases, limit identification to second, rather than third, level of indeture.	X		X	X		
15	Safety Item Identification	None	X					
20	INSURV Number	Sometimes, more than one deficiency would be included on a single 2K.	X					X
26	Deferral Date	None	X					
27 50 52 57	Estimated Manpower	Estimates would be made at broader levels	X	X	X	X		
35	Remarks/Description	Descriptions of material condition and statements of required maintenance would in general be more extensive than present practice	X		X	X	X	
37	CSMP Summary Title	None				X		X
38 39	First Contact	None					X	
40	Second Contact	None					X	
41	Priority	In some cases, multiple priority level work would be included in same 2K	X			X		
42	Type of Availability	None	X	X		X		
44	Screening Action	In some cases, multiple accomplishing activity work would be included in same 2K.	X	X		X		
45								

## ANALYSIS OF ALTERNATIVE METHODS

### 4.1 INTRODUCTION

Section 3 of this report discussed the advantages and disadvantages associated with one specific approach to integration of POT&I Program and MDCS practices during ROH planning. Certain variations to that approach might be considered. Figure 8 illustrates four potentially promising methods. Method 2 has already been discussed in detail in Section 3; the other three potential methods are discussed below:

### 4.2 METHOD 1: ELIMINATE USE OF RIR BLOCK 21

#### 4.2.1 Description of Method 1

In this approach, the RIR would be used to record POT&I planning data (blocks 1-14), procedures (block 15), and material condition (block 16), but not maintenance requirements (block 21). This information would be used as the basis for generating a set of 2Ks covering work requests intended for incorporation into the ROH work package. It is assumed under this method any number of 2Ks (including none at all) could result from each RIR.

#### 4.2.2 Analysis of Method 1

In this approach, all existing practices relative to completing the RIR (other than the requirement that recommended maintenance be recorded in block 21) would remain as currently specified in TS 4730-100. No change to the OPNAV Form 4790/2K would be necessary. The following changes to procedures for filling out the form would, however, be required:

- a. Current instructions prescribe that both "condition" and "recommended maintenance" be included in block 35 of the 2K. Under Method 1, this instruction would be modified to eliminate need for reporting "condition".
- b. Since, in Method 1, the POT&I report partially depends on the MDCS, it would be virtually essential that there be positive traceability from "maintenance items" to "POT&I items". There are a variety of ways in which this could be accomplished, including any of the following:
  - 1) Add SWBS number (3 digit) to the 2K form in block 14, 35, or 46.
  - 2) Add SWBS and item number for the related POT&I (5 digit) in either block 35 or 46.
  - 3) Add POT&I key number (6 digit), as appearing in the CRUDES Class POT&I Index, in block 35 or 46.

The principal advantage of this approach is that it does eliminate some degree of redundancy and has minimum impact on existing 3M procedures and practices.



#### 4.3 METHOD 3. PREPARE MULTIPLE FORM 2Ks, AS APPROPRIATE

##### 4.3.1 Description of Method 3

This method would be similar to Method 2 except that the constraint that 2Ks be prepared on a one-for-one basis with RIRs would be removed. Under this proposed method, criteria for preparing 2Ks would be basically as follows:

- a. For each given RIR, separate 2Ks would be prepared to cover the maintenance requirements of each echelon (i.e., ship's force, IMA, and yard) of maintenance.
- b. For each given RIR, separate 2Ks would be prepared to cover each level of priority.
- c. "Various" APL items can be grouped into a single 2K.
- d. Various serially-numbered or identification-numbered items can be grouped into a single 2K.
- e. "Location", as entered in block 16 of the 2K, can be limited to compartment. "Various" can be entered in that block, as appropriate.

##### 4.3.2 Analysis of Method 3

The significant advantage to this approach is that it reduces existing redundancy in source data generation, and maximizes the traceability between the POT&I and MDCS programs without significantly detracting from ROH planning functions. The principal disadvantage is that, like Method 2, significant visibility regarding the reliability and maintainability of individual APL items would be sacrificed. In a more specific sense, this would mean, for example, that current maintenance history analyses such as DART would be limited to rankings or measurements based on EIC instead of APL.

#### 4.4 METHOD 4. ELIMINATE RIR

##### 4.4.1 Description of Method 4

In this approach, the CSMP would totally replace the RIR as the major vehicle for recording POT&I planning and reporting data. Accordingly, POT&I planning data (i.e., data now recorded in blocks 1-15 of the RIR) would be recorded using a 2K, and processed (including entry into the CSMP). When POT&Is are conducted, one or more separate 2Ks are prepared, if appropriate, to record deferred maintenance requirements. The original 2K covering the conduct of the POT&I item is reported as a completed action and the new 2Ks covering deferred maintenance entered into the CSMP.

This approach need not affect the format of the 2K. However, certain procedural changes would be required. For example, it would be desirable to provide traceability between related POT&Is. (This could be provided by recording the POT&I key number in block 46.) Also, it would be necessary to broaden the current 3M system definition of "deferred maintenance" to include "POT&I items". Also, since the CSMP would become a major source of POT&I planning visibility, new CSMP report formats would most likely be required. This, together with the increased MDCS reporting load



created by this approach, represents an increased workload on the applicable 3M data processing facility.

Figure 9 illustrates the manner in which, under Method 4, POT&I planning and reporting would interface with the CSMP. As hypothesized, the following procedure would apply:

- a. Prior to (or independent from) POT&I program implementation, ship's force would conduct routine tests, inspections (e.g., PMS, OPPE, etc.) and, where appropriate, prepare 2Ks to cover deferred maintenance. These items would comprise the CSMP.
- b. At a scheduled point in the ROH planning cycle, PERA would compile a ship POT&I plan based on the CSMP and a type/class POT&I plan. An element of that plan would be a set of 2Ks covering the POT&I items. These items would be entered into the CSMP (see Figure 10).
- c. CSMP summary reports, together with the POT&I plan, would provide the tools used in conduct of the POT&I program.
- d. As appropriate, completed action reports for POT&I items are submitted.
- e. Simultaneously, as appropriate, new 2Ks covering deferred maintenance identified during POT&I are prepared and submitted. In preparing the 2Ks, the applicable POT&I control number is recorded on the form (block 46).
- f. The CSMP summary reports, together with the set of 2Ks and supplemental data sheets, where specified, would constitute the POT&I report.

#### 4.4.2 Analysis of Method 4

The principal advantages of Method 4 are that it:

- a. Is responsive to the intent that all shipboard maintenance data collection be within the framework of the 3M system.
- b. Eliminates considerable source data redundancy in ROH planning.
- c. Provides a considerable degree of POT&I automated program planning and reporting, using 3M facilities and capabilities.
- d. Enhances the ability to analyze the effectiveness of the POT&I program.

The principal disadvantages of this method are that:

- a. It requires translation of the present POT&I planning baseline into 2K format and entry into the 3M (or equivalent) data bank.
- b. Timeliness of POT&I planning and reporting would be constrained by 3M data processing capabilities.
- c. Certain POT&I planning data (e.g., MIP number and phasing data) would be sacrificed.

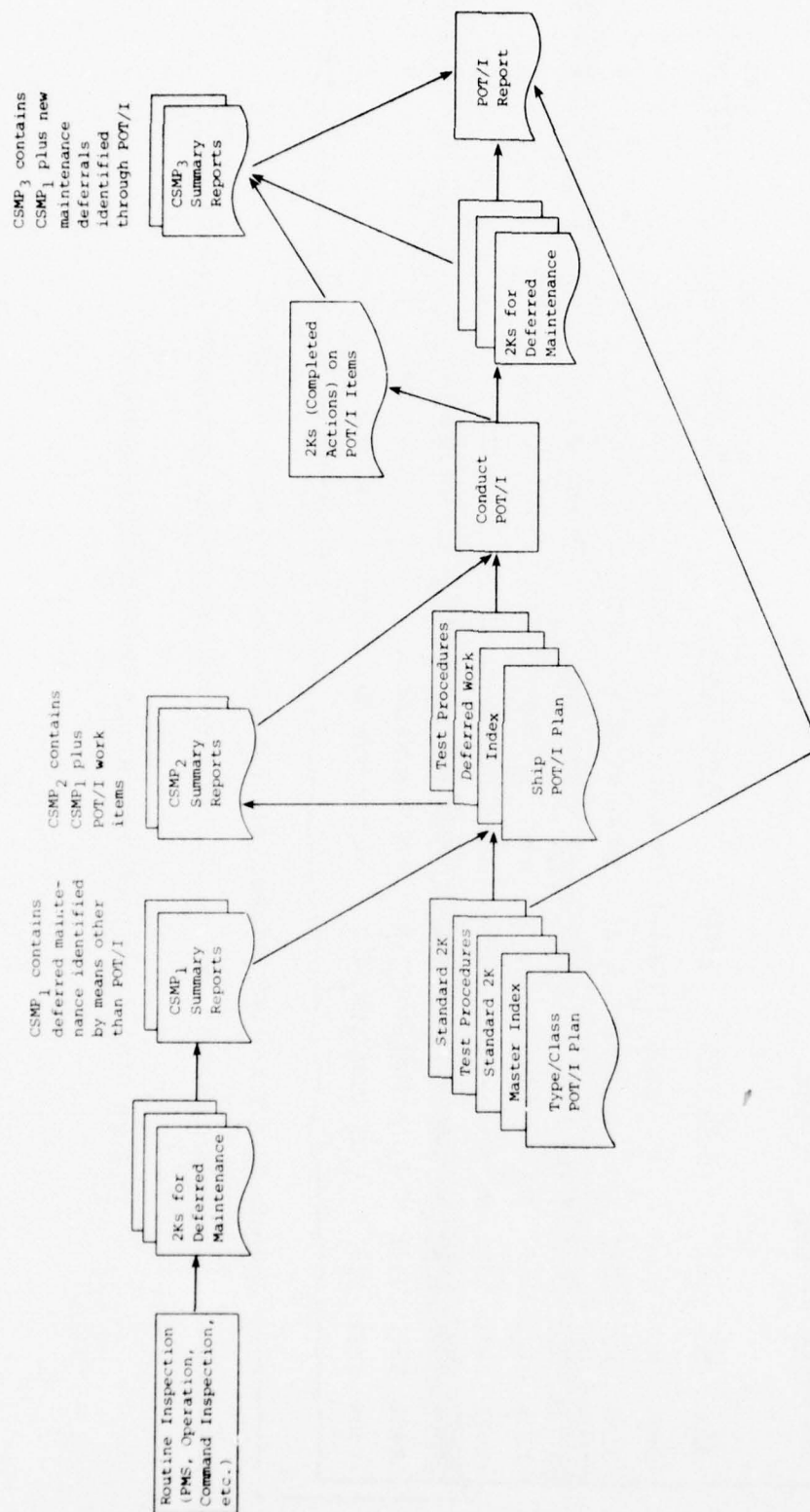


Figure 9. Flow Diagram Highlighting Interfaces Between POT/I Program and MDCS

CURRENT SHIPS MAINTENANCE PROJECT REPORT 1 - OPTION E

USS XXXXX FF XXXX UIC XXXXX PAGE X

EIC	WC	JSN	NOUN NAME	IDENT	CSMP SUMMARY	DEFR DATE	DEFR REASON	PRI	TYPE	AVAILABILITY
1404	EB01	1190	DECK GRATING	B-1-1	REPL ALUMINUM GRATING	22 DEC 73	6	3	2	
310C	EB01	1077	SSTG RED GEAR	1-2	THERM WELLS NOT SECURED	17 NOV 73	2	3	4	
AD01	ER01	1234	WT/AT DOORS	VAR	POT/I WT DOORS	10 JAN 74	0	3	4	
F101	EB01	1155	SUPERHEATER	1	DIST THERMOMETER INOP	8 MAY 73	4	3	1	
F303	EB02	1555	MN FEED PUMP	4	SHAFT SLEEVE SCORED	9 APR 73	2	2	4	
F303	EB01	1733	MN FEED PUMPS	ALL	POT/I MN FEED PUMPS	10 JAN 74	0	2	1	
F401	EB01	1121	FDB INSTRUMENTS	1-6	TACHS MISSING	9 JAN 73	2	3	4	
F506	EB01	1157	QUICK CLOS VLV	1-2	PROTECTIVE SHLDS MISSING	11 NOV 73	2	1	2	

Example 1: POT/I item; related deferred maintenance previously defined.

Example 2: POT/I item; no related deferred maintenance previously defined.

Figure 10. Example of CSMP Report That Includes POT&I Items

## APPENDIX A

### COMPARISON OF RIR, WORK REQUEST, AND JOB ORDER REPORTING LEVELS

The data contained in this appendix are based on a review of recent ROH information for a sample of three FF-1052 class destroyers. The table contains the following for each third-level Ship's Work Breakdown Structure (SWBS) item:

- a. Number of POT&I items, as defined in the General POT&I Index contained in Technical Specification 4730-100.
- b. Number of work requests contained in the ROH work package of each of the three ships sampled (FF-1066, FF-1067, FF-1058).
- c. Average number of work requests for the three ships sampled.
- d. Number of shipyard job orders for each of the three ships sampled.
- e. Average number of job orders for the ships sampled.

The purpose of the data is to illustrate, in a gross sense, that the current degree of compatibility between RIR, work request, and job order boundaries varies from ship to ship and system to system within the ship. A review of the data provides the following observations:

- a. In many items (e.g., SWBS Nos. 114, 313, 523) there currently is apparent compatibility between boundary criteria in that the number of RIRs, work requests and job orders is virtually the same.
- b. In certain cases (e.g., SWBS 251, 255, 311, 521, 631), there is apparent disparity between RIR and work request boundary definitions.
- c. In certain cases (e.g., SWBS 221, 512, 581), there is apparent disparity between RIR and job order boundary definitions.

The data included in this appendix are intended to provide guidance in identifying:

- a. Specific systems/equipments that do not apparently require further consideration with respect to reporting criteria.
- b. Specific RIR items that are candidates for subdivision.
- c. Specific systems/equipments that apparently require additional criteria for determining work request and/or job order boundaries.



[illegible]

[illegible]

WBS NO.	SYSTEM	NO. POT/I ITEMS	NO. OF WORK REQUESTS				NO. OF JOB ORDERS			
			1066	1067	1058	AVG	1066	1067	1058	AVG
411	Data Display Group		3			1	3			1
421	Non-Elect. Elex. NAV Aids	3	2		4	2	2	1	4	2
422	Elect. NAV Aids	2	5	3	4	3	5	3	2	3
423	Elex. NAV Systems Radio	3	4			1	4			1
424	Elex. NAV. Syst. Accoust.	1	1	1	1	1	1	1	1	1
426	Elect. NAV. Syst.	3	10	10	22	14	4	5	9	6
431	Swbds. for I.C. Systems	1		1		1		1		1
432	Telephone Systems	2	3	6	2	4	3	3	2	3
433	Announcing Systems	2	1	6	3	3	1	2	1	1
434	Entertainment & Trn. System	4				-				-
435	Voice Tubes					-				-
436	Alarm, Safety & Warn.	1	4	22	5	10	4	4	5	4
437	Indicating, Order & Metering	2	12	5	13	10	4	3	2	3
438	Integ. Control System	-				-				-
439	Recording & Television	-				-				-
441	Radio Systems	51	12	7	12	10	9	3	5	6
442	Underwater Systems	1				-				-
443	Visual & Audible System	5				-				-
445	TTY and FAX System	19			2	1			2	1
446	Security Equipment	7				-				-
450	Surv. Systems (Surf.)	6			7	2			4	1
451	Surf. Search Radar	1	6	13	9	9	6	4	7	6
452	Air Search Radar	1	10	6	1	6	6	4	1	3
454	Aircraft Control Radar									
455	Ident. Systems (IFF)	6	8		3	4	4		1	2
462	Passive Sonar	-				-				-
463	Active/Passive Sonar	2	4	68	7	26	4	5	3	4
465	Bathymograph	1				-				-
471	Active ECM	2	8	4	14	9	6	4	7	6
472	Passive ECM	9	23	13	9	15	14	9	4	9
473	Torpedo Decoys	1				-				-
474	Decoys (Other)									
475	Degaussing	1		1	1	1		1	1	1
481	Gun Fire Control System	9	6	13	8	9	4	4	6	15
482	Fire Control Sys. (Non-Sonar)	9	5	2		2	2	2		1
483	Fire Control Syst. (Sonar)	11	3		3	2	1		3	1
489	Fire Control Syst. Swbd.	2				-				-
491	Elex. Test & C/O Equip.	-		4	1	2		1	1	1
	- CONTINUED -									

WBS NO.	SYSTEM	NO. POT/I ITEMS	NO. OF WORK REQUESTS				NO. OF JOB ORDERS			
			1066	1067	1058	AVG	1066	1067	1058	AVG
502	Auxiliary Machinery (General)	-	1	1		2	1	1		1
505	Piping Reqmnts, General	-		1		1		1		1
508	Thermal Insulation, General	-	9	4	1	5	1	1	1	1
511	Compartment Heating	2			1	1				1
512	Ventilation System	1	5	2	13	7	3	2	10	5
513	Mchy Space Vent System	1	10	19		9	2	3		2
514	Air Cond. System	3	9	1	4	5	2	1	4	2
516	Refrigeration System	1	13	6	8	9	2	1	8	3
521	Firemain and Flushing	4	24	17	3	15	2	2	3	2
522	Sprinkler System	1	8	3	17	9	3	3	4	3
523	Washdown System	1			1	1			1	1
524	Auxiliary Sea Water	1		1	2	1		1	2	1
526	Scuppers & Deck Drains	1	2		3	2	2		3	2
527	Firemain Actuated Services	-			4	1			4	1
528	Plumbing Drainage	1				-				-
529	Drainage & Ballasting	5	5	8	8	7	1	5	6	4
531	Distilling Plant	4	16	15	6	12	1	3	6	3
532	Cooling Water	-			4	1			4	1
533	Potable Water	5		3	13	5		1	3	1
534	Aux. Stm. & Drns. (Mchy Sp.)	11	29	50	13	30	10	27	13	17
535	Aux. Stm. & Drns. (Other)	2	3	7	3	4	3	3	3	3
536	Aux. Fr. Water Cooling	2	7		2	3	2		2	1
541	Ship Fuel & Fuel Comp.	4	16	9	5	10	2	7	5	5
542	Aviation & General Purp. FO	3		4	6	3		2	4	2
543	Aviation & General Purp. LO	2		1		1		1		1
545	Tank Heating	1				-				-
551	Compressed Air System	6	26	16	19	20	5	8	10	8
555	Fire Exting. System	6	2	4	1	2	2	2	1	2
561	Steering Control	1	5	9	12	9	2	3	5	3
562	Rudder	1	1	1	3	2	1	1	1	1
565	Trim and Heel	-	7	4		3	2	1		1
566	Stabilizing Fins	1				-				-
571	Unrep. Systems	2	2	5	3	3	2	2	1	2
572	Ships Stores & Hand. Equip.	1		5	2	2		1	2	1
573	Cargo Handling	1				-				-
574	Vert. Repl. Systems	-				-				-
581	Anchor Handling & Stowage	1	6	9	6	7	3	3	5	4
582	Mooring & Towing	2				-				-
	-CONTINUED -									





[illegible]



## APPENDIX B

### COMPARISON OF RIR, SWBS, AND EIC BOUNDARY CRITERIA

The data contained in this appendix provide a comparison of the relative level of detail defined by:

- a. Repair Inspection Records (RIRs), as defined in the General POT&I Index contained in PERA(CRUDES) Technical Specification 4730-001.
- b. The three-level Ship's Work Breakdown Structure, as defined in NAVSHIPS 0900-039-9010.
- c. The three-level Equipment Identification Code, as defined in the EIC Master Index.

Each RIR, as contained in the General POT&I Index, is listed in the tables of this appendix. The columns reflect degree of detail (i.e., "less", "same" or "greater") of each RIR item relative to SWBS and EIC. The purpose of the information presented in this appendix is to:

- a. Identify RIR items that are candidates for subdivision, if it is desired to enhance commonality between the RIR and SWBS/EIC boundary definitions.
- b. Identify those items that are candidates for SWBS expansion.



			Detail Relative to SWBS			Detail Relative to EIC						Detail Relative to SWBS			Detail Relative to EIC		
			Less	Same	Greater	Less	Same	Greater				Less	Same	Greater	Less	Same	Greater
110 01 A000	Hull		X						255 10 F30K	Mn Condensate Piping				X			X
111 01 A101	Shell Plating			X			X		255 11 F30K	Feed Wtr Piping Sys			X				X
114 01 A101	Shell Appendages			X			X		255 12 F30B	Emergency Feed Pump			X		X		
116 01 A300	Hull Framing			X		X			255 13 TH04	FW Drain Tank/Pump			X			X	
120 01 A800	Hull Bulkheads		X			X			255 14 F30D	Emer Fd Bstr Pmp MD			X		X		
123 01 A900	Trunks/Enclosures			X		X			256 01 FB00	SW Circulating Sys			X	X			
130 01 A501	Hull Decks		X				X		256 02 310E	SSTG Circulat Pump			X			X	
140 01 A500	Platforms/Flats		X			X			256 03 FB01	Mn Circulat Pump MD			X		X		
150 01 A600	Deck House		X			X			256 04 FB03	Mn Circulat Pump TD			X		X		
150 02 A604	Expansion Joints		X				X		258 01 TH04	HP Steam Drain Sys		X				X	
161 01 AA01	Stern Tubes				X		X		259 01 F601	Mn Prpln Uptakes		X				X	
161 02 AA01	Shaft/Prop Struts				X			X	261 01 F500	FO Service System			X	X			
161 03 AA01	Rudder Bearing Trk				X		X		261 02 F501	Mn FO Svec Pump TD			X	X			
162 01 F601	Stacks and Macks			X			X		261 03 F503	Mn FO Svec Pump MD			X	X			
163 01 AB01	Sea Chests			X			X		261 04 F505	P/CR FO Svec Pump MD			X	X			
165 01 AF01	Sonar Domes			X			X		262 01 FD00	Mn LO System			X	X			
167 01 AD01	WT/AT Doors			X			X		262 02 FD01	Mn LO Svec Pump TD			X	X			
167 02 AD05	Hatches			X			X		262 03 FD03	Mn LO Svec Pump MD			X	X			
167 03 AD06	Scuttles			X		X			262 04 FD07	Mn Lub Oil Purifier			X			X	
167 04 AD06	Manholes/Covers			X			X		262 05 T304	Electr Precipitatr			X			X	
169 01 AD00	Spcl Prp Closures			X			X		264 01 FD00	LO Fill/Xfr/Purif		X		X			
171 01 AE01	Masts			X			X		311 01 310C	SSTG Set 60 HZ		X			X		
171 02 AE06	Towers			X			X		312 01 3301	Emer Diesel Gen			X	X			
171 03 AE05	Tetrapods			X			X		312 02 3308	Emer Gas Turb Gen			X	X			
172 01 AE03	Kingposts			X			X		313 01 410D	Batteries/Chargers		X			X		
179 01 AE07	Service Platforms			X			X		314 01 4700	MG Sets			X				
182 01 A701	Prpln Plant Fdns			X			X		314 02 4700	Line Volt Regulator			X				
183 01 A703	Electric Plant Fdns			X			X		314 03 4700	Rectifiers			X				
184 01 A703	Command/Surv Fdns			X			X		314 04 4000	Pwr/Ltg Xfmrs			X				
185 01 A703	Aux Systems Fdns			X			X		314 05 4700	Voltage Monitors			X				
186 01 A703	Outfit/Furnishing Fdns			X			X		314 06 4700	Volt/Freq Monitors			X				
187 01 A703	Armament Fdns			X			X		321 01 430B	Ship Svec Cable Sys			X	X			
192 01 A904	Oil and Water Tanks			X			X		321 02 4306	Shore Pwr Term Box			X	X			
200 01 U504	Sea Trial				X		X		323 01 4800	Casualty Power Sys		X		X			
200 02	Machy Vibration			X			X		324 01 4100	Swbds and Panels		X	X	X			
200 03	Relilient Mounts			X			X		324 02 4300	Emergency Power		X	X	X			
221 01 F101	Boiler			X			X		324 03 4300	Bus Xfr Switches		X	X	X			
221 01 F103	Press Fired Botler			X			X		331 01 4500	Lighting Cables			X	X			
221 02 F101	Auto Combs/Fdw Cont			X			X		331 02 4503	Ltg Panels/Boxes			X	X			
221 02 F103	Auto Combs/Fdw Cont			X			X		332 01 4505	Lighting Fixtures		X		X			
231 01 FB00	Prpln Steam Turbine		X			X			341 01 310D	SSTG Lube Oil Sys		X		X			
241 01 FC01	Main Reduction Gear			X			X		342 01 3300	Diesel Support Sys		X	X	X			
241 02 FC01	Main Turning Gear			X			X		343 01 3308	Gas Turb Sprt Sys		X	X	X			
243 01 FE03	Stern Tube Seal			X			X		411 01 5	WDS/WDE			X	X			
243 02 FE03	Internal Shafting			X			X		411 02 G	TDS System			X	X			
243 03 FE03	External Shafting			X			X		411 03 QM06	AN/UYA Displays			X	X			
244 01 FE03	Line Shaft Bearing			X			X		411 04 P800	AN/SYA Displays			X	X			
244 02 FE03	Stern Tube Bearing			X			X		412 01 Q	Data Processing Sys		X		X			
244 03 FE03	Strut Bearing			X			X		413 01 Q	Digital Data Swbds		X		X			
245 01 FE06	Propeller		X				X		414 01 Q	Cmd Cont Intfc Eq		X		X			
251 01 F401	Forced Draft Blower			X		X			415 01 Q	Dgtl Data Coram Cont		X		X			
251 02 F103	Supercharger			X			X		417 01	Command Cont Swbds			X	X			
252 01 FJ01	Prpln Cont Console			X			X		417 02	WDS/WDE/TDS Swbds			X	X			
253 01 F700	Mn Steam Piping Sys		X			X			421 01 LF00	Misc Nav Aids			X	X			
254 01 FA00	Main Condensing Sys			X		X			421 02 LG00	Magnetic Compass			X	X			
254 02 310E	SSTG Condensing Sys			X			X		421 03 LH00	Metrl Instruments			X	X			
254 03 F808	Gland Cond Exh Fan			X			X		422 01 L300	Navigational Lights			X	X			
254 04 F808	Gland Exh/Lkoff Cnd			X			X		422 02 7DF1	Helicopter Lights			X		X		
255 01 F30J	Deaerating Fd Tank			X			X		423 01 L100	Loran			X	X			
255 02 F303	Main Feed Pump			X			X		423 02 L600	Tacan			X	X			
255 03 F30H	Mn Condensat Pmp MD			X			X		423 03 N900	Radio DF System			X	X			
255 04 F30G	Mn Condensat Pmp TD			X			X		423 04 L300	Omega			X	X			
255 05 F308	Mf Booster Pump TD			X			X		423 05 L700	Electronic Sextant			X	X			
255 06 F309	Mf Booster Pump MD								424 01 H500	Navigation Sonar		X		X			
255 07 F30E	Reserve Fd Xfr Pump			X			X		426 01 LB00	Gyrocompass Sys			X	X			
255 08 F30E	Reserve Fd Xfr Pr Pump			X			X		426 02 LC01	Underwater Log Sys			X		X		
255 09 3103	SSTG Condensate Pump			X			X		426 03 LD00	Dead Reckoning Sys			X	X			

		Detail Relative to SWBS			Detail Relative to FIC		
		Less	Same	Greater	Less	Same	Greater
431 01 4100	IC Switchboards		X		X		
432 01 M401	Dial Telephone Sys		X		X		
432 02 M403	SP Telephone Sys		X		X		
432 03 M400	Ckt F and Ckt FM		X			X	
432 04 M400	Ckt MJ Mult Talk		X			X	
433 01 M301	Central Ampl Aneg		X		X		
433 02 M303	IC Announcing Sys		X		X		
433 03 M304	Ckt CK NTDS Comm		X		X		
434 01 M100	Tng/Entertainmt TV		X		X		
434 02 M700	Ckt SE Entertainment		X		X		
434 03 M701	Ckt MP Snd Mtn Pict		X		X		
434 04 M700	Portable Projectors		X		X		
435 01 M306	Voice Tube/Msg Pass		X		X		
436 01 M500	Alm/Saf/Wrn Sys		X		X		
437 01 M600	Ind/Order Sys		X		X		
437 02 L H07	Ckt HD/HE Wd Dir/Sp		X		X		
439 01 M100	Television Systems		X		X		
439 02 M700	Recording Systems		X		X		
441 01 Q100	Comm Antenna System		X		X		
441 02 Q900	Antenna Tuning Sys		X		X		
441 03 Q800	Antenna Xfr Sys		X		X		
441 04 QC00	Radio Remote Cont		X		X		
441 05 QB00	Comm Receivers		X		X		
441 06 QD00	Comm Transceivers		X		X		
441 07 QE00	Comm Transmitters		X		X		
441 08 Q700	Audio Amplifiers		X		X		
441 09 Q600	Terminal Voice Sys		X		X		
441 10 QP00	Sat Comm		X		X		
441 11 QS00	Quality Monitoring		X		X		
441 12 QR00	Comm Spcl Test Eqpt		X		X		
441 13 QN00	Microwave Comm Sys		X		X		
441 14 QK00	Special Comm Sys		X		X		
442 01 R600	UW Comm System		X		X		
442 02 QJ04	AN/SSQ-1A Sonobuoy		X		X		
443 01 QA00	Infrared Systems		X		X		
443 02 LF00	Audible Comm Sys		X		X		
443 03 LK00	Signalling Lights		X		X		
445 01 Q300	Teletype Systems		X		X		
445 02 QL00	Facsimile Systems		X		X		
445 03 Q400	Terminal Switch Sys		X		X		
446 01 QF00	Cryptographic Sys		X		X		
450 01 P900	Radar Distr Sys		X		X		
450 02 P700	Radar Displays		X		X		
450 03 PC00	Radar Trainers		X		X		
450 04 PF00	Radar Aux Devices		X		X		
450 05 PB00	AEW Terminal Eqpt		X		X		
451 01 P100	Surf Search Radar		X		X		
452 01 P300	Air Search Radar 2D		X		X		
452 02 P503	Air Search Radar 2D		X		X		
453 01 P400	Hgt Finder Radar 3D		X		X		
453 02 P31	Hgt Finder Radar 3D		X		X		
453 03 P540	Hgt Finder Radar 3D		X		X		
455 01 P600	IFF System		X		X		
459 01 PE00	Satellite Trk Radar		X		X		
460 01 R600	Special Sonar Sys		X		X		
460 02 M700	Sonar Recorder		X		X		
461 01 R100	Active Sonar System		X		X		
462 01 R900	Passive Sonar		X		X		
463 01 R100	Act/Paly Sonar Sys		X		X		
463 02 R300	Var Depth Sonar Sys		X		X		
465 01 R700	Bathymograph Sys		X		X		
471 01 N900	Active ECM Systems		X		X		
471 01 NC00	Active ECM Systems		X		X		
471 01 NB00	Active ECM Systems		X		X		
471 02 ND00	ECM Test Eqpt		X		X		
472 01 N600	Passive ECM Systems		X		X		
472 02 N900	ECM DF System		X		X		
472 03 M700	ECM Recorder		X		X		
473 01 N100	Torpedo Decoy		X		X		
473 02 NB06	AN/SIQ-25 Torp CM		X		X		
474 01 GF00	Mk 28 CHAFFROC Sys		X		X		
475 01 N400	Degaussing Systems		X		X		
481 01 G000	GFCS		X		X		
481 02 GZ00	Misc GFC Eqpt		X		X		
481 03 GY00	Gun Sys Test Eqpt		X		X		
482 01 5000	GMFC Systems		X		X		
482 02 5F00	GMFC Checkout Eqpt		X		X		
482 03 5H00	Misc GMFC Eqpt		X		X		
483 01 J000	ASW FCS		X		X		
483 02 J000	UW FC Support Eqpt		X		X		
489 01 G000	GFC Swbd		X		X		
489 02 5000	GMFC Swbd		X		X		
489 03 J000	UB FC Swbd		X		X		
491 01 W000	Electronic Test Eqpt		X		X		
505 01 U603	Piping Insul/Lag		X		X		
511 01 T100	Compartment Heaters		X		X		
511 02 T10A	Steam Heating Sys		X		X		
512 01 T300	Ventilation System		X		X		
513 01 T300	Mchry Rms Vent Sys		X		X		
514 01 T404	Air Cond Plant		X		X		
514 02 T404	Air Cond Piping Sys		X		X		
514 03 T404	Air Cond Sctn Unit		X		X		
516 01 T500	Refrigeration Plant		X		X		
517 01 T104	Aux Boiler Sys		X		X		
520 01 T800	Sea Water System		X		X		
521 01 T801	Firemain System		X		X		
521 02 T803	Flushing System		X		X		
521 03 T801	Fire Pumps MD		X		X		
521 04 T801	Fire Pumps TD		X		X		
521 05 T801	Prmg Rtry Fire Pump		X		X		
521 06 1801	Gas Fire Pump P-250		X		X		
522 01 T804	Sprinkler Systems		X		X		
523 01 T805	Washdown System		X		X		
524 01 T805	Aux SW Cooling Sys		X		X		
524 02 T806	Aux SW Cooling Pump		X		X		
526 01 TC00	Scuppers/Deck Drain		X		X		
528 01 T706	Plumbing Drainage		X		X		
529 01 TA01	Main Drainage Sys		X		X		
529 02 TA01	Secondary Drainage		X		X		
529 03 TA03	Bilge/Ballast Sys		X		X		
529 04 T607	FO Stripping System		X		X		
529 05 T607	FO Stripping Pump		X		X		
531 01 TK00	Distilling Plant		X		X		
531 02 TK00	Distiller Feed Pump		X		X		
531 03 TK00	Dist Htr Drain Pump		X		X		
531 04 TK00	Distillate Pump		X		X		
531 05 TK00	Dist Brine Ovhd Pump		X		X		
533 01 TB01	Fr Water Sys		X		X		
533 02 TB03	FW Chlorination Sys		X		X		
533 03 TB03	Hot Fresh Wtr Pump		X		X		
533 04 TB03	Priming FW Pump		X		X		
533 05 TC03	Drinking Wtr Cooler		X		X		
533 06 TB01	Hot FW Heater		X		X		
533 07 TB03	SS Fresh Water Pump		X		X		
533 08 TB03	Hot FW Washing Pump		X		X		
533 09 TB03	Pre-Heate Bstr Pump		X		X		
534 01 TH01	Aux Exhaust Piping		X		X		
534 02 TH03	LP Aux Steam Piping		X		X		
534 03 TH03	HP Aux Steam Piping		X		X		
534 04 F100	Boiler Blow Piping		X		X		
534 05 TH04	Steam Drain Collect		X		X		
534 06 TH01	Aux Gland Leakoff		X		X		
534 07 TH03	GI Seal/Vent Mn Tur		X		X		
534 08 TH03	Glad Seal/Vent SSTG		X		X		

		Detail Relative to SWBS			Detail Relative to FIC		
		Less	Same	Greater	Less	Same	Greater
534 09 TH03	Mn Steam Reduc Stas			X			X
534 10 TH04	Mn Turb Drain Piping			X			X
534 11 TH03	Dump Augment Valves			X			X
535 01 TH04	Whistle Seam Drain			X			X
535 02 TH01	Atmospheric Exhaust			X			X
536 01 PG00	Radar Cooling Sys			X			X
536 02 RB00	Sonar Cooling Sys			X			X
536 03 TB04	NTDS Cooling Sys			X			X
536 04 NE00	ECM Cooling Sys			X			X
536 05 TB04	JPTDS Cooling Sys			X			X
536 06 TB04	FC Radar Clg Sys			X			X
541 01 TD09	FO Transfer Pump			X		X	
541 02 TD08	FO Tank Level Ind			X		X	
541 03 TD06	FO Filling System			X		X	
541 04 TD08	FO Transfer System			X		X	
542 01 T605	JP-5 Service Pump			X		X	
542 02 T605	JP-5 Transfer Pump			X		X	
542 03 T605	JP-5 Piping System			X		X	
542 04 T607	JP-5 Stripping Sys			X		X	
543 01 T606	Aviation Lube Oil			X		X	
543 02 FD07	Gen Purpose Lub Oil			X		X	
545 01 TF01	FO Tank Heating		X			X	
551 01 TF01	HP Air System			X		X	
551 02 TF03	LP Air System			X		X	
551 03 TF01	HP Air Compressor			X		X	
551 04 TF03	LP Air Compressor			X		X	
551 05 TF03	MP Air Compressor			X		X	
551 06 TF04	Elex Dry Air Sys			X		X	
551 07 N704	Prairie Masker Sys			X		X	
553 01 TG00	Oxygen Nitrogen Sys		X			X	
555 02 T906	CO2 Hose Reel Sys			X		X	
555 03 T903	Foam Fire Ext Sys			X		X	
555 04 T901	CO2 Port Ext			X		X	
555 05 T901	Dry Chem Ext			X		X	
555 06 T907	Stm Smothering Sys			X		X	
561 01 TL01	Steering Gear Sys		X			X	
562 01 TL01	Rudder		X			X	
566 01 TR00	Stabilizing Fins		X			X	
571 01 TT01	Msl/Cargo Stream			X		X	
571 02 TT03	Fueling at Sea			X		X	
571 03 TT05	Non Tensioned Eqpt			X		X	
572 01 TN00	Ship Stores Hdlg			X		X	
572 01 TN00	Personnel Eqpt Hdlg			X		X	
572 02 TT0C	Vert Stores Cnvr			X		X	
573 01 TS00	Cargo Handling		X			X	
581 01 TM00	Anchor Handling Sys		X			X	
582 01 TM05	Mooring/Towing Gear			X		X	
582 02 TM06	Warping Capstan			X		X	
583 01 Y100	Personnel Boat			X		X	
583 02 Y300	Utility Boat			X		X	
583 03 Y300	Motor Whale Boat			X		X	
583 04 YA00	CO2 Inflatable Boat			X		X	
583 05 YC00	Gen Boat Hdlg			X		X	
585 01 TJ01	Antenna Operat Gear		X			X	
588 01 TU00	Helicopter Handling		X			X	
593 01 T700	Sewage Trmt Sys			X		X	
593 02 TB03	Garbage Disposal			X		X	
593 03 T700	Garbage Dspl Pump			X		X	
611 01 1100	Hull Fittings		X			X	
612 01 1103	Itails/Stan/Lifeline			X		X	

		Detail Relative to SWBS			Detail Relative to FIC		
		Less	Same	Greater	Less	Same	Greater
612 02 1103	Safety Nets			X			X
613 01 1300	Rigging and Canvas		X			X	
621 01 1501	Non-Strl Bulkheads		X			X	
622 01 1404	Floor Plate Grating		X			X	
623 01 1403	Accommodation Ladders			X			X
623 02 1403	Movable Ladders			X			X
623 03 1401	Fixed Ladders			X			X
624 01 1503	Non-Strl Closures		X			X	
625 01 1108	Airports/Windows		X			X	
631 01 UF06	Painting		X			X	
633 01 1106	Zinc Anodes			X			X
633 02 1106	Impres Cur Cath Sys			X			X
634 01 1601	Deck Covering		X			X	
635 01 1701	Hull Insulation		X			X	
636 01 1000	Hull Damping		X			X	
637 01 1701	Sheathing		X			X	
638 01 1000	Refrigerated Spaces		X			X	
640 01 1C00	Furn/Living Spaces	X				X	
644 01 T700	Extrs/Sanitary Spaces		X			X	
651 01 1B01	Galley Equipment			X		X	
651 02 1B03	Scullery Equipment			X		X	
652 01 1D00	Medical Spaces		X			X	
654 01 1A00	Utility Spaces		X			X	
655 01 1A01	Laundry Equipment		X			X	
656 01 1A05	Trash Dspl Space			X		X	
656 02 191V	Paper Shredder			X			X
661 01 1C00	Office Furnishings		X			X	
662 01 1C00	Furn/Mehry Cont Ctr		X			X	
663 01 1C00	Elex Cont Centers		X			X	
664 01 1805	Damage Control Stas		X			X	
665 01 1900	Workshop Equipment		X			X	
671 01 1800	Lockers/Spcl Stwg		X			X	
672 01 1800	Storerm/Issue Rms		X			X	
711 01 GB00	Gun Mounts			X		X	
711 02 GA00	Gun Turrets			X		X	
712 01 GW00	Ammunition Handling		X			X	
713 01 A905	Ammunition Stowage		X				X
721 01 5A00	GMLS			X		X	
721 02 JJ00	ASROC Launching Sys			X		X	
721 03 JC00	ASW Launcher			X		X	
721 04 T804	Missile Bstr Supprs			X			X
722 01 TT04	Missile Hdlg Eqpt			X		X	
722 01 8600	Missile Handling Eqpt			X		X	
722 02 JFCA	ASROC Handling Eqpt			X		X	
722 02 8500	UWS Handling Eqpt			X		X	
722 03 8800	SWS Handling Eqpt			X		X	
722 04 8900	Mult Prp Hdlg Eqpt			X		X	
722 05 TT0A	Weapons Elevators			X		X	
723 01 A905	Missile Stowage			X			X
723 02 A905	Rocket Stowage			X			X
728 01 TB04	ASROC Clg/Htg			X			X
728 02 TB04	Anti Icing Systems			X			X
751 01 JI000	Torpedo Tubes		X			X	
752 01 JF00	Torpedo Hdlg Sys			X		X	
752 01 8500	Torpedo Hdlg Sys			X		X	
752 01 8900	Torpedo Hdlg Sys			X		X	
753 01 A905	Torpedo Stowage		X				X
761 01 GF00	Saluting Guns			X		X	
761 02 8A00	Night Vision Sight			X		X	
763 01 A905	Small Arms Stowage		X				X

## APPENDIX C

### ANALYSIS OF CURRENT 3M REPORTING AT INDIVIDUAL APL LEVEL

The data contained in this appendix provide an analysis of 3M "level-of-reporting" practices, based on a review of FF-1052 Class maintenance history for calendar year 1974. The tables of this appendix show the following information for the top 150 EIC equipment (third indenture) level items:

- a. Rank, based on total quantity of maintenance man-hours reported at the organizational level.
- b. Total number of class maintenance actions reported for that item.
- c. The percentage of those items that were reported at the major equipment (e.g., "boiler", "main feed pump", "dishwasher", "motor whaleboat") APL/AEL level.
- d. The percentage of those items that were reported at the component (e.g., valve, relay, controller) APL/AEL level.
- e. The percentage of those items that were not APL/AEL related.

The data in this appendix identify the specific ship systems/equipments that would be affected by relaxation of 3M APL/AEL reporting criteria. An additional potential use of the data is to identify items that appear to warrant selective consideration if it is desired to augment existing reporting criteria, or subdivide existing RIRs, with the objective of enhancing the current reliability and maintainability analysis capability.



# SUMMARY OF MAINTENANCE ACTIONS

MAJOR SYSTEM ADMINISTRATION, HAB, OUTFIT & FURNISHINGS

EIC	ITEM	RANK	MAINTENANCE ACTIONS			
			TOTAL NO.	% EQ. APL	% COMP. APL	% NO. APL
1801	Galley Equipment	7	755	50.3	0	49.7
1000	Admin., Hab., etc. (General)	17	983	0	2.3	97.7
1910	Mechanical Cleaning Equipment	34	15	6.6	0	93.4
1600	Deck Covering	40	198	0	0.5	99.5
1A01	Laundry Equipment	52	295	58.9	14	27.1
1108	Miscellaneous Fittings	54	266	0	3	97
1C01	Living, Office, Cont. Center, Machinery Space Furnishings	56	391	0	3.1	96.9
1103	Safety and Guard Fittings	59	330	0	0	100
1C00	Living, Office, Cont. Center, Mach. Space Furn. and Equipment	80	278	2.7	2.7	94.6
1B03	Scullery Equipment	82	246	56.7	11	33.3
1700	Hull Insulation, Sheathing	83	129	0	0	100
1801	Firefighting Locker	92	46	5	42.8	52.2
1A06	Misc. Items Mfr. by Tender	97	509	0	1.3	93.7
1503	Doors, Structural	100	146	0	4.1	95.9
1100	Hull Fittings	104	103	0	6.8	93.2
1001	Medical, Dental Equipage	121	49	0	0	100

## MAJOR SYSTEM ADMINISTRATION, HAB., OUTFIT &amp; FURNISHINGS

C-4

# SUMMARY OF MAINTENANCE ACTIONS

## MAJOR SYSTEM ELECT. POWER GENERATION & DISTRIBUTION

EIC	ITEM	RANK	MAINTENANCE ACTIONS			
			TOTAL NO.	% EQ. APL	% COMP. APL	% NO. APL
310C	Generator Set, 60Hz, TD	22	601	66.9	26.4	6.7
310E	Auxiliary Condenser	31	315	65.0	26.7	8.3
4505	Permanent Light Fixtures	33	393	0	53.9	46.1
3301	Emergency Gen. Set, 60Hz Diesel	36	223	78.9	18.0	3.1
310D	SSTG, L.O. System	74	202	27.4	47.3	25.3
3101	SSTG, 60Hz Diesel	88	184	71.7	24.0	4.3
4703	MG Set 60-400Hz	96	184	34.8	63.6	1.6
3300	Emergency Gen. Plants	132	31	64.5	32.3	3.2
4101	Ships Serv. Switchboards, 60Hz	138	96	63.5	30.2	6.3
3100	Ships Serv. Gen. Plants	145	54	51.8	44.5	3.7

# SUMMARY OF MAINTENANCE ACTIONS

## MAJOR SYSTEM HULL STRUCTURE

EIC	ITEM	RANK	MAINTENANCE ACTIONS			
			TOTAL NO.	% EQ. APL	% COMP. APL	% NO. APL
A000	Hull Structure (General)	23	298	0	3.3	96.7
A501	Decks	38	90	0	0	100
A905	Compartments	39	143	0	4.2	95.8
AD05	Hatches, WT	42	122	0	0.8	99.2
AD01	Doors, WT	45	258	0	0.4	99.6
A603	Expansion Joints	58	50	0	4.0	96.0
A601	Superstructure Blkhs.	65	43	0	0	100
AB01	Scoop, Cond. Injection, Sea Chest	109	41	0	0	100
A600	Superstructure	124	48	0	0	100
A904	Tanks	135	48	0	0	100
A304	Pillars and Stanchions	140	33	0	0	100



# SUMMARY OF MAINTENANCE ACTIONS

MAJOR SYSTEM    PROPULSION SYSTEM

EIC	ITEM	RANK	MAINTENANCE ACTIONS			
			TOTAL NO.	% EQ. APL	% COMP. APL	% NO. APL
F101	Boilers	1	1905	63.7	25.0	11.3
F303	Main Feed Pump Unit (Turb. Driven)	8	550	78.2	81.1	2.9
F703	Main Steam Valves	11	142	0	70.4	29.6
F401	Blower Group, Air Supply	12	620	0	95	5
F801	Turbine, H.P., Mn. Prop.	21	128	78.9	15.6	5.5
F100	Steam Gen. & Controls	28	239	21.4	40.9	37.7
FD00	Lube Oil System	41	114	19.3	28.9	51.8
F30H	Main Condensate Pump	43	87	74.7	23.0	2.3
F30K	Piping, Valves, Mn. Cond.	44	271	8.1	59.8	32.1
FD07	Lube Oil Syst. Piping, etc.	50	218	18.3	51.0	30.7
F701	Main Steam Piping	64	133	0	30.8	69.2
F507	F.O. Piping and Access	68	320	0	55.9	44.1
F300	Mn. Feed and Cond. System	75	102	20.6	51.0	28.4
F000	Mn. Prop. System	77	172	10.0	18.5	71.5
F704	Main Steam Accessories	79	244	0	58.2	41.8
F309	Mn. Feed Pump Unit (Mtr. Driven)	85	116	86.7	10.4	3.4

### SUMMARY OF MAINTENANCE ACTIONS

MAJOR SYSTEM PROPULSION SYSTEM[illegible]

# SUMMARY OF MAINTENANCE ACTIONS

MAJOR SYSTEM SURFACE MISSILE, GUN AND ASW SYSTEMS

EIC	ITEM	RANK	MAINTENANCE ACTIONS			
			TOTAL NO.	% EQ. APL	% COMP. APL	% NO. APL
GB19	5"/54, MK 42, MOD 9	3	1306	0	91.9	8.1
G12M	AN/SPG 53A Radar	18	939	91.3	7.0	1.7
JP43	MK 53, MOD 0, 1 Attack Console	20	523	91.0	2	7
JJ61	ASROC Launcher MK 112, MODS 1, 2, 3, 4	35	496	0	87.7	12.3
G11K	MK 68, MOD 3 Gun Director	49	375	?	?	5.3
G17A	MK 47 MODS 10, 11 Computer	70	321	?	?	1.0
JJ00	ASROC Launch Group	73	202	0	60.4	39.6
5AEB	MK 25, MOD 1 Launching System	89	396	0	97.5	2.5
G100	MK 68 GFCS	102	182	53.3	31.9	14.8
5BEA	MK 76, MOD 0 Director	108	174	96.7	1.0	2.3
G142	MK 1, MOD 1 Radar Signal Processing Eq.	117	136	?	?	7.4
G12Q	AN/SPG 53D Radar Set	141	75	?	?	22.7

# SUMMARY OF MAINTENANCE ACTIONS

## MAJOR SYSTEM NAVIGATION, INTERIOR COMM. AND COUNTERMEASURES

EIC	ITEM	RANK	MAINTENANCE ACTIONS			
			TOTAL NO.	% EQ. APL	% COMP. APL	% NO. APL
N81P	AN/WLR-IC Countermeasures Receiving Sets	9	461	96	2	2
NC0Z	AN/ULQ-6 Countermeasure Set	27	240	93	2	5
M403	Sound Pow. Phone System	30	346	0	60.4	39.6
M303	Announcing Systems	60	147	0	75.5	24.5
NC0E	AN/SLA-15 Antenna Group	63	185	?	?	1.0
M704	16 mm Movie Projector	81	250	88.2	6.2	5.6
LD0Q	ASW Plotting System MK NC-2 MOD 2A	95	53	90	10	0
N40Q	Degaussing System W/SM-14 Control	101	34	0	94.1	5.9
LD0A	MK 9 MOD 2 Dead Reckoning Analyzer	122	47	91.7	4	4.3
N81G	AN/WLA-3A Amplifier Group, ECM	130	103	98.1	0	1.9
LB0Q	MK 19, MOD 3C Gyrocompass	136	118	70	20.7	9.3



# SUMMARY OF MAINTENANCE ACTIONS

MAJOR SYSTEM RADAR, IFF, COMMUNICATIONS & SONAR

EIC	ITEM	RANK	MAINTENANCE ACTIONS			
			TOTAL NO.	% EQ. APL	% COMP. APL	% NO. APL
R13R	AN/SQS-26CX	2	1491	97	1.3	1.7
P30U	AN/SPS 40A Radar Set	6	308	97	1.7	1.3
R13S	Sonar Power Supply	10	379	?	?	10.0
R30B	AN/SQA-13	13	363	?	?	9.4
QE1N	AN/URT-23(V)	26	262	?	?	14.5
R30L	AN/SQS-35(V)	37	330	?	?	22.4
P11B	AN/SPS 10F Radar Set	47	361	?	?	0.8
P716	AN/SPA 50A	48	154	88	10.7	1.3
R50Z	AN/UQN-4	69	196	70.9	21	8.1
P60Y	AN/UPX 11	72	55	94.5	3.7	1.8
P71F	AN/SPA-66 Indicator Group	78	202	95	4.5	.5
Q931	AN/SRA-51 Coupler	98	101	93	1.1	5.9
QB3A	R-1051B Radio Receiver	103	389	98	1.7	.3
P31W	AN/SPS-40D	105	72	100	0	0
Q000	Communications System	109	99	11		39
R900	Sonar Systems, Passive	115	3	0	0	100

# SUMMARY OF MAINTENANCE ACTIONS

MAJOR SYSTEM RADAR, IFF, COMMUNICATIONS & SONAR

EIC	ITEM	RANK	MAINTENANCE ACTIONS			
			TOTAL NO.	% EQ. APL	% COMP. APL	% NO. APL
QD3S	AN/SRC-21 Radio Set	119	178	98	2	0
P61L	AN/UPA-59 (V) 2 Decoder Group	120	58	?	?	20.7
QD6H	AN/SRC-20A Radio Set	128	98	99	0	1
QD6N	AN/URC-9A Radio Set	129	163	84	6.8	9.2
P70M	AN/SBA-25A Indic. Group	133	174	98.9	0	1.1
QD3R	AN/SRC-20 Radio Set	147	142	97.9	0	2.1
QE1V	AN/WRT-1A Transmitter	149	67	79.1	0	20.9

# SUMMARY OF MAINTENANCE ACTIONS

MAJOR SYSTEM    AUXILIARY SYSTEMS

EIC	ITEM	RANK	MAINTENANCE ACTIONS			
			TOTAL NO.	% EQ. APL	% COMP. APL	% NO. APL
TK03	Distilling Plant L.P. Flash Type	4	699	40.9	52.7	6.4
T801	Firemain	5	453	37.5	33.1	29.4
T404	Air Cond. System (Chilled Water) CR-12	14	544	29.1	40.9	11.8
TF03	IP & LP Air Systems	19	460	48.5	32.5	19.0
TF01	HP Air System	24	453	62.2	28.7	9.1
T800	Firemain, Etc. Salt Water Systems	25	243	33.9	34.2	31.9
TR01	Stabilizer	46	183	67	29.7	3.3
TH04	HP/LP Drains	51	255	10	57.8	32.2
TB00	Fresh Water Systems	55	203	15.7	55.7	28.6
T300	Ventilation Systems	62	382	15	29.5	55.5
TB06	Sea Water Serv. System	66	122	25	37.3	37.7
T503	Refrigeration Plant	76	228	39	47	14.0
TH00	Aux. Steam Exhaust System	84	113	0	39	61
T804	Sprinkling Systems	86	360	0	37.2	62.8
TM03	Ground Tackle	87	108	0	20.3	79.7
T000	Auxiliary Systems (General)	90	164	6	37.3	56.7

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